$P < 0.05$) among fully vaccinated children (n = 101) when compared to unvaccinated children (n = 141). Secondly, there was no significant reduction in ILI and visits to physician among partially vaccinated children (n = 52) versus unvaccinated children (OR 1.54 [0.77–3.07], $P = 0.24$ and OR 1.81 [0.65–5.27], $P = 0.30$) respectively. **CONCLUSIONS:** Based upon these findings, it is concluded that seasonal influenza vaccine is effective in reducing the ILI and visits to physician for ARI among fully vaccinated Indian children. Partially vaccinated children had no statistically significant protection against ILI and visits to physician. To the best of our knowledge, this is the first report on the clinical effectiveness of seasonal influenza vaccine in healthy Indian children.

**PIN9**

### EFFICACY AND SAFETY OF RALTEGRAVIR IN TREATMENT NAIVE HIV+ PATIENTS: A MIXED TREATMENT COMPARISON APPROACH

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**OBJECTIVES:** To assess the efficacy and safety of raltegravir (integrase strand transfer inhibitor) compared to non-nucleoside reverse transcriptase inhibitors (nevirapine, efavirenz) and protease inhibitors (lopinavir, atazanavir) in treatment-naive patients with HIV infection. **METHODS:** A systematic literature search identified seven treatment naïve trials comparing raltegravir to other treatments of interest via the common comparator efavirenz. This network of evidence was analyzed using a Mixed Treatment Comparison (MTC). Selected outcomes were the proportion of patients with plasma HIV RNA less than 50 copies per mL at 48 weeks (efficacy) and discontinuations (safety). A Bayesian approach was chosen and implemented in WinBugs. Fixed-effect and random-effect models were run and the most appropriate model was selected based on the performance of the Monte Carlo simulations and the Deviance Information Criterion. Results were reported as median odds ratio, relative risk, and risk difference of raltegravir versus each comparator and associated 95% credible intervals. Bayesian inference also allows for treatment to be ranked, by calculating the proportion of simulations in which this treatment performs "best" in terms of relative efficacy/safety. **RESULTS:** For both efficacy and safety outcomes the fixed-effect models were preferred. Efficacy results showed a significant advantage of raltegravir compared to atazanavir, lopinavir, and nevirapine. Raltegravir also performed numerically better than efavirenz, and overall had a 71% probability of being the more efficacious treatment on this outcome. Safety results also favored Raltegravir, but significance was only reached compared to nevirapine. **CONCLUSIONS:** The MTC suggests that raltegravir has an advantage that is at least numerical and in some cases statistically significant over its comparators in term of achieving plasma HIV less than 50 copies per mL and avoiding discontinuation, providing additional data that supports the use of raltegravir in this indication.

**PIN10**

### A SYSTEMATIC REVIEW OF THE ATTRIBUTION OF HUMAN PAPILLOMAVIRUS TYPES AMONG CERVICAL INTRAEPITHELIAL NEOPLASIA AND CERVICAL CANCERS IN JAPAN BY SAMPLING METHODS

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**OBJECTIVES:** Estimating vaccine effectiveness is crucial for policymakers. Human Papillomavirus (HPV) type-specific attribution to cervical cancers and precancers is one key factor in this regard for HPV vaccination and cancer screening. Among a number of reports on HPV type prevalence, only a few investigated attributions considering multitype infections and sampling methods. The objective of this study was to elucidate HPV type-specific attribution in Japanese women. **METHODS:** A systematic review of published studies was conducted. Sampling methods were divided into two categories: one group consists of studies where HPV DNA was extracted from exfoliated cells, and another group consists of those using tissue specimens obtained by biopsy or surgical resection. To elucidate interrelationships among multiple HPV types in contributing to lesion development, attribution of each HPV was estimated assuming a fractional allocation of multitype infection. **RESULTS:** The overall positivity for any HPV was consistently higher in the exfoliated-cell group. On the other hand, attribution of HPV types 16 and 18 to cervical lesions was nominally higher in the tissue-specimen group. Attribution of HPV types 16 and 18 to cervical squamous cell carcinoma (SCC) was estimated as 47.4% (95% CI: 43.8–51.1) and 9.4% (7.5–11.7) in the tissue-specimen group and 43.3% (38.5–48.2) and 7.6% (5.4–10.6) in the exfoliated-cell group, respectively. **CONCLUSIONS:** HPV positivity was higher in the exfoliated-cell group while type 16/18 attribution was nominally higher in the tissue-specimen group. Attribution of HPV type 16 to SCCs and adenocarcinomas (AC) derived from tissue specimens, after adjustment for multitype infections, was ~20% lower in Japanese women compared to data previously reported for US women. Type 18 attribution in Japanese women was similar to the United States for SCC and 10% lower for AC.

## INFECTION – Cost Studies

**PIN11**

### COST ANALYSIS OF ADVERSE DRUG EVENTS GROM GPO-VIR®S AND GPO-VIR®Z IN PEOPLE LIVING WITH HIV/AIDS IN THAILAND

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**OBJECTIVES:** GPO-VIR® S (Stavudine, Lamivudine, Navirapine) has been used in people living with HIV/AIDS in Thailand since 2002. Drug resistance and adverse drug events (ADEs) are likely to be found. To solve this problem, GPO-VIR® Z (Zidovudine, Lamivudine, Navirapine) has been developed since 2005. Therefore, this study was conducted to evaluate the cost of ADEs found in people living with HIV/AIDS receiving GPO-vir® S compared with GPO-vir® Z. **METHODS:** A retrospective cohort study design was used to determine the ADE costs of GPO-vir® S and GPO-vir® Z based on provider's perspective. Direct medical costs (i.e., drug, laboratory, hospitalization, administration etc. ) were directly collected from patient profiles from March 2005 to May 2008 at Nakornping hospital, Chiangmai province, Thailand. Total cost and average cost per ADE were calculated. **RESULTS:** A total of 136 patients were studied. Of those, 95 cases received GPO-vir® S and 41 cases received GPO-vir® Z. Total ADEs found were 57 and 14 in GPO-vir® S and GPO-vir® Z groups respectively. Lipodystrophy (52.6%) was mostly found in GPO-vir® S group while anemia (28.7%) was found in GPO-vir® Z group. The total cost was 923,971 baht and 65,594 baht in GPO-vir® S and GPO-vir® Z respectively. An average cost per event in GPO-vir® S group was 16,210 baht and GPO-vir® Z group was 4686 baht. **CONCLUSIONS:** Although treatment with GPO-vir®Z seems to present lower costs of ADEs, selection of drug regimen still need to depend on the symptoms of individual patient.

**PIN12**

### COST-OF-ILLNESS OF CHRONIC HEPATITIS B INFECTION IN VIETNAM

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**OBJECTIVES:** To quantify the financial burden of chronic hepatitis B (CHB) infection and its complications in a cost-of-illness study in Vietnam, a highly endemic country of hepatitis B virus (HBV) infection. **METHODS:** The study adopted the micro-costing approach. For direct medical cost estimation, data were retrieved retrospectively from medical histories of inpatients and outpatients with various CHB infection stages in 2008 from a large referral hospital in Vietnam. For direct nonmedical and indirect cost estimation, data were obtained from outpatients from the same hospital through face-to-face interviews. One- and two-way analyses were performed on the cost calculated. **RESULTS:** In 2008, the total cost of CHB infection and its complications was estimated to be around US$ 10 billion, with 80% contributable to direct medical cost. Antivirals were the major cost driver in treating CHB infections. The per-patient total annual direct medical cost increased with the severity of the disease with the cost amounted to US$ 943.64 for CHB and US$ 3916.21 for hepatocellular carcinoma. Based on the results, if all Vietnamese patients received treatment for CHB infections, the estimated cost would be twice as much as the total health budget of Vietnam, highlighting that a significant proportion of CHB infections in Vietnam are not being treated, and the patients are bearing the extra cost out-of-pocket, or seeking treatment from traditional medicines. **CONCLUSIONS:** This study confirms that chronic HBV infection poses an unbearable financial burden for the average patient with a GDP per capita of around $1024, and the lack of access to treatment is a social issue in Vietnam. Although universal newborns vaccination against HBV has been implemented to reduce the number of infected subjects, more health-care investment to improve access and provision of affordable medications by re-examining pharmaceutical policies to attain equity in proper treatment for patients with CHB infections would be needed.

**PIN13**

### BURDEN AND MEDICAL COSTS OF ANOGENITAL WARTS IN BANGKOK, THAILAND

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**OBJECTIVES:** 1) Assess the proportion of anogenital warts to the total number of Sexual Transmitted Infection (STI); and 2) Quantify the direct medical costs of anogenital warts from patient perspective. **METHODS:** A prospective observational study was conducted in STI Clinic at Bangrak Hospital, Bangkok, Thailand from June 2008–September 2009. The proportion of anogenital warts to the total number of STI was calculated from the database of Bangrak Hospital. A total of 131 patients with clinically diagnosed anogenital warts were recruited. After baseline assessment, the patients had three additional follow-up-visits at day 7, month 1, and month 3. On each visit, patients were examined and interviewed for health-care costs, work productivity loss and activities impairment. At month 6, telephone assessment for the signs of disease recurrence was done. Patients were treated according to standard medical practice. **RESULTS:** The proportion of anogenital warts to the total number of STI in 2008 was 14.6%. The mean age (SD) of the study subjects was 28.2 years (7.4 years). Males and females were approximately equal (males 51.9%, female 48.1%). Most of them were employed (51.1%), the rest were sex workers (25.2%),

and students (18.3%). The majority (83.2%) were treated with podophyllin paints. At 6 months, 55.0% were cured, 25.2% still had ongoing genital warts, 5.7% had a recurrence, 12.2% were lost to follow-up and 1.5% was discontinued. The median direct medical costs were 998 (range 130–4060) Thai Baht. All patients were treated as out-patient cases and 71.7% came to hospital without work absenteeism. After having genital warts lesion, work productivity was reduced to 83.0% (17.3) and daily activity was also declined to 82.4% (14.4) from baseline. **CONCLUSIONS:** Anogenital warts are common STI and tend to be recalcitrant to treatment. They also lead to the reduction on work productivity and daily activity.

**PIN14**

### PUBLIC HEATH AND ECONOMIC IMPACT OF ROTAVIRUS VACCINATION IN KOREA

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**OBJECTIVES:** In Korea, rotavirus gastroenteritis rarely causes mortality, but it causes significant morbidity among young children. The objective of this study was to estimate the public health burden and the potential impact of universal vaccination with a three-dose pentavalent rotavirus vaccine in Korea. **METHODS:** A Markov cohort simulation model was developed to project the expected clinical burden of rotavirus gastroenteritis and the potential impact of universal vaccination (vs.no vaccination) if all children are given a three-dose pentavalent rotavirus vaccine for the 2007 birth cohort of 493,189 Korean infants during the first 5 years of life. Vaccine efficacy for preventing rotavirus and the associated use of health-care resources was based on the Rotavirus Efficacy and Safety Trial (REST) results. Data on rotavirus related health-care resource utilization were based on published sources. Data on the cost of treating rotavirus diarrhea were extracted from a hospital cost survey and the National Health Insurance claims data. One-way sensitivity analysis was conducted by varying the health-care resource utilization and the discount rate from 3% to 7%. **RESULTS:** The three-dose rotavirus vaccination program would result in the prevention of 181,238 symptomatic cases (reduction rate: 63.2%), 27,200 hospital admissions (90.8%), 7602 emergency department visits (86.5%), and 538,399 outpatient visits (76.7%) during the 5 years after birth if all children are vaccinated. The break even price of vaccination was estimated to be between KW 50,454 and 61,667 per dose. **CONCLUSIONS:** Implementing a three-dose universal rotavirus vaccination strategy would likely result in a substantial reduction in rotavirus related health-care resource utilization in Korea. These results may be useful for evaluating rotavirus vaccination programs in Korea.

**PIN15**

### COST-EFFECTIVENESS ANALYSIS OF 1-YEAR PEGINTERFERON ALFA-2A VERSUS 3 YEARS ENTECAVIR FOR THE TREATMENT OF HBEAG-POSITIVE CHRONIC HEPATITIS B IN CHINA

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**OBJECTIVES:** The objective of the study was to evaluate the cost-effectiveness of 1-year peginterferon alfa-2a compared to 3 years entecavir for the treatment of HBeAg-positive chronic hepatitis B in China. **METHODS:** A Markov health-state model was designed to evaluate the direct medical costs and outcomes (life-years and QALYs gained) of treating HBeAg-positive chronic hepatitis B in China. The model included 10 health states—Chronic hepatitis B (CHB), HBeAg seroconversion, HBsAg loss, CHB with resistance, Compensated cirrhosis, Decompensated cirrhosis, Hepatocellular carcinoma, Liver transplant, Post-liver transplant and death. The model incorporates a maximum analysis time horizon of 80 years with yearly cycles. The clinical and quality of life data were obtained from published literature and re-confirmed based on a questionnaire survey from a clinical expert panel of 20 hepatitis B specialists. From the perspective of China's health insurance system, cost data was calculated based on the published literature about economic burden of chronic hepatitis B. A discounting rate at 3% was used to discount medical costs happened at different years. A univariate sensitivity analysis was performed to understand the key drivers and general sensitivity of the model. **RESULTS:** The model results showed that the utilization of 1-year peginterferon alfa-2a treatment for HBeAg-positive CHB can prolong 0.885 QALYs, compared to the 3 years entecavir treatment. The total cost per patient treated with peginterferon alfa-2a was CNY 151,770 (US$ 22,221), and CNY 129,239 (US$ 18,922) for patient treated with entecavir. The discounted incremental cost per QALY gained for pegainterferon alfa-2a was CNY 25,452 (US$ 3,727). **CONCLUSIONS:** The results of the model suggest that 1 year pegainterferon alfa-2a improves health outcomes in a cost-effective manner compared with 3 years entecavir in the treatment of HBeAg-positive chronic hepatitis B in China.

**PIN16**

### COMPARATIVE CRITICAL REVIEW OF COST-EFFECTIVENESS TOOLS OF PNEUMOCOCCAL CONJUGATE VACCINE (PCV)

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**OBJECTIVES:** Several decision support tools have been developed to aid policy decision-making regarding the adoption of pneumococcal conjugate vaccine (PCV) into national immunization programs. Lacking critical evaluation of the tools causes decision-makers difficulties in understanding and feeling ownership of information resulting from the tools, particularly in resource poor countries where technical capacity is lacking. This study aims to critically compare decision-making tools and their cost-effectiveness (CE) findings, and to identify influential parameters in the models. The overall objective is to provide decision makers with a menu of CE tools and their characteristics for their optimal use rather than to recommend a single model. **METHODS:** The WHO requested access to publicly available CE tools for PCV from both public and private provenance. All tools were assessed according to WHO's economic evaluation guideline. All key attributes and characteristics were compared. A series of sensitivity analyses were performed to determine the major drivers of the models. The results were compared using a standardized set of input parameters. **RESULTS:** Three CE tools, including PAHO ProVac's TriVac, PneumoADIP and GSK's SUPREMES tools, were provided. They all compared the adoption of PCV into national immunization program with no immunization. The models differed in terms of attributes, structure, and data requirement, but captured similar range of diseases. Herd effect was estimated using different approaches. The main driving parameters were vaccine efficacy against pneumococcal pneumonia, vaccine price and coverage, serotype coverage and disease burden. With a standardized set of input parameters, TriVac and PneumoADIP provided similar findings including incremental costs, outcome and incremental cost-effectiveness ratio. **CONCLUSIONS:** Models differed in terms of model structure and key assumptions. Vaccine price and efficacy were the most influential parameters. Understanding differences and similarities of CE tools could provide policymakers more efficient use for aiding their decision-making process.

**PIN17**

### COST-EFFECTIVENESS ANALYSIS OF THE NEW PCV-13 VACCINE WHEN COMPARED TO NO VACCINATION FROM A PUBLIC HEALTH-CARE SYSTEM PERSPECTIVE IN HONG KONG

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**OBJECTIVES:** Cost-effectiveness studies using local health data have supported the long-term health and economic benefits of the 7-valent pneumococcal conjugate vaccine (PCV-7) due to herd immunity, which also led to its inclusion in the routine immunization program for infants in Hong Kong in September 2009. The aim of the present study is to assess the clinical and economic impacts of the new PCV-13 vaccine on the whole population of Hong Kong compared to no vaccination. **METHODS:** A decision analytical model modified from the recent Prevenar 13$^{O}$ Economic Impact (PREVENT) Model (RTI Health Solution$^{O}$) was used for the analysis of the outcomes of vaccination. The whole population of Hong Kong of around 7 million was analyzed with infants ≤2 either vaccinated or not vaccinated with PCV-13. Population data, incidence rates, serotype coverage, disease sequelae, mortality rates, vaccine effectiveness, duration of protection, herd effects, utilities, cost of vaccination, and other direct costs were adopted from local published studies, previous economic assessments of PCV-7/PCV-13 and local government sources to populate the model. Data were adopted from overseas published studies if local data was not available. Sensitivity analyses were performed to check the robustness of the results. The time horizon was one year and the study was performed from a public health-care organization perspective. **RESULTS:** Over 1 year, our analysis shows for a four-dose regimen of PCV-13: a gain of 17 quality-adjusted-life-years (QALY), an avoidance of 1281 related illnesses and two deaths. Cost/life-year gained was US-145,014 and cost/QALY was -US161,127. **CONCLUSIONS:** Based on the WHO recommended international thresholds for cost-effectiveness, with GDP per capita of Hong Kong being US29,902 in 2009, our study results suggest PCV-13 vaccination is very cost-effective in providing protection to the people of Hong Kong from the perspective of a public health-care organization.

**PIN18**

### COST-EFFECTIVENESS ANALYSIS OF UNIVERSAL NEWBORN VACCINATION AGAINST HEPATITIS B VIRUS IN VIETNAM

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**OBJECTIVES:** To perform a cost-effectiveness analysis of universal newborn vaccination against hepatitis B virus (HBV) and to identify the affordability of the program in Viet Nam, a highly endemic country of HBV infection. **METHODS:** Marginal cost of every life-year and quality-adjusted life-year (QALY) gained with universal newborn vaccination against HBV was calculated using a Markov model. Two types of analyses (including and excluding expenditure on the treatment of chronic hepatitis B and its complications) were performed. We conducted one-way sensitivity analyses to confirm the robustness of the results. We used Monte Carlo simulations to examine the affordability of the vaccination program from payer's perspective to derive an affordability curve for the program. **RESULTS:** In the base-case scenario, universal newborn vaccination against HBV reduced the carrier rate by 72%, and increase number of life-years and QALY gained of a 2008 birth cohort by 1.8 years (71.21 years vs. 69.41 years) and 2.26 years (71.03 years vs. 68.77 years), respectively. Marginal cost per life-year and per QALY gained were US$ 18.82 and US$ 13.16, much lower than the annual GDP per capita of around US$1024). The probability of the vaccination program to be both cost-effective and affordable is 60% at an annual program cost of US$253,000 (from the payer's perspective), where the threshold cost-effective value is US$ 13.16 per QALY gained. **CONCLUSIONS:** Universal newborn vaccination